

## Aquarium test helps scientists look for life in extreme environments

By MARY HARDIN

NASA's search for life elsewhere in the solar system has brought JPL space scientists to the giant kelp forest exhibit at the Monterey Bay Aquarium to test a new scientific probe that is a precursor to one that might one day look for life in oceans that may exist on Jupiter's icy moon Europa.

JPL researchers have been conducting these first-time engineering tests at the California aquarium as a precursor to an experiment that will place a scientific probe in an underwater Hawaiian volcanic vent later this year.

The Lo'ihi Underwater Volcanic Vent Mission Probe will investigate an undersea volcano located 27 kilometers (20 miles) east of the Big Island of Hawaii at a depth of about 1,300 meters (4,250 feet).

"The purpose of using the Monterey Bay Aquarium kelp tank is to begin testing the instruments in an aquatic environment that contains some biological material that will stimulate and test the hardware," said JPL's Dr. Lonnie Lane, principal investigator for the experiment. "The information to be gathered from these experiments at the aquarium and later in Hawaii will prepare us for future missions to difficult places like Antarctica's Lake Vostok (under 4 kilometers [2.5 miles] of ice), and below the surface of Jupiter's ice-encrusted moon Europa."

The use of the aquarium also provides a cost-effective, controlled environment for this first experiment. Open-ocean opportunities with deep-diving submersibles are extremely limited and often expensive, Lane explained.

"As part of JPL's new astrobiology effort, we are bringing new instrumentation and approaches to areas that in the past have been deemed either very difficult or impossible to explore," he said.

"The long-range goal of this experiment is a multi-faceted investigation of deep-ocean volcanic vents and sea floor cracks from which very hot water flow out into the deep ocean. The foremost question we are trying to answer is: Can and do simple biological species exist

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NASA's search for life elsewhere in the solar system brought space scientists to the Monterey Bay Aquarium to test a new scientific probe that might one day look for life in oceans that may exist on Jupiter's icy moon Europa. In this picture, Lloyd French, project lead and system architect for the probe mission, deploys the JPL probe in the aquarium's kelp forest exhibit.



John Beckman

## News Briefs

**John Beckman** has been named manager of the Systems Division 310.

Beckman, who joined JPL in 1971, had previously served as manager of the Solar System Exploration Program Office 710.

**Douglas Stetson** has been named acting manager of the Solar System Exploration Program Office. □

Through its Technology Affiliates Program, JPL has reached an agreement with toy manufacturer Uncle Milton Industries to provide educational material for the company's new line of space-related toys.

JPL will provide information on the Mars Exploration Program for the company's "Mars and

Beyond" toys, which include a terra-colony habitation module, drink unit, walkie-talkie and robotic extender arm. Each of these products comes with a "mission manual," a small booklet for which JPL has provided technical and educational content.

"The company is very interested in the educational aspects of its toys," said **Jim Rooney** of the Technology Transfer and Commercialization Office. "They came to Mars scientists to provide technically and scientifically correct background information on Mars, its geology and history, and future exploration."

The company, based in Westlake Village, said the relationship with JPL will be extended with future

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## Special Events Calendar

### Ongoing

**Alcoholics Anonymous**—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. For more information, call Occupational Health Services at ext. 4-3319.

**Codependents Anonymous**—Meeting at noon every Wednesday. For more information, call Occupational Health Services at ext. 4-3319.

**Gay, Lesbian and Bisexual Support Group**—Meets the first and third Fridays of the month at noon in Building 111-117. For more information, call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

**Parent Support Group**—Meets the fourth Tuesday of the month at noon. For location, call Jayne Dutra at ext. 4-6400.

**Senior Caregivers Support Group**—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. For more information, call (626) 397-3110.

### Friday, September 4

**JPL Dance Club**—Meeting at noon in Building 300-217.

**NOVA Vouchers Expire**—ERC vouchers that were received as part of a NOVA award expire today. For questions, call the Reward &

Recognition Program office at 4-3706.

### Tuesday, September 8

**JPL Scuba Club**—Meeting at noon in Building 168-427.

**JPL Stamp Club**—Meeting at noon in Building 183-328.

### Wednesday, September 9

**Eudora Training For Technical Staff**—This session for PC users features an introduction to using Eudora and its various features, and offers more detail than the sessions for business users. At noon in the Building 167 conference room.

**Investment Advice**—Jasson Rasmussen of Fidelity Investments will be available for individual appointments. Call Patrice Houlemard at ext. 4-2549.

**JPL Amateur Radio Club**—Meeting at noon in Building 238-543.

**JPL Drama Club**—Meeting at noon in Building 301-127.

**JPL Toastmasters Club**—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. For more information, contact Mary Sue O'Brien at ext. 4-5090.

**SESPD Lecture Series**—Discipline scientist Dr. Ulf Issraelson of the Planetary, Astrophysics and Microgravity Flight Experiments Program will discuss "A Roadmap For Fundamental Physics in

Microgravity." At 11 a.m. in von Kármán Auditorium.

### Friday, September 11

**Dodger Baseball**—Last day to purchase tickets at the ERC for the Sept. 23, 7:35 p.m. game with the San Diego Padres and the Sept. 27, 1:05 p.m. game against the Milwaukee Brewers (Fan Appreciation Day). Tickets are \$12.

**JPL Dance Club**—Meeting at noon in Building 300-217.

### Tuesday, September 15

**Associated Retirees of JPL/Caltech**—Members will gather at the Caltech campus for a picnic. Cost: \$14. For information, call Lila Moore at (818) 790-5893.

**Information Architecture: Making Your Web Site a Better Communication Vehicle**—Alix Kneifel, web developer, Section 393, will discuss the fundamentals of information architecture, the key to building a good web site framework. Learn how to make sites more effective by organizing information so that anyone can easily access it. At noon in von Kármán Auditorium.

### Wednesday, September 16

**Chinese Language Class**—Basic instruction in the language is offered starting at noon in Building 306-400. For information, e-mail to wangp@rockymt.jpl.nasa.gov.

**JPL Drama Club**—Meeting at noon in Building 301-127.

**JPL Hiking Club**—Meeting at noon in Building 303-209.

**Russian Language Workshop**—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

### Thursday, September 17

**JPL Astronomy Club**—Meeting at noon in Building 198-102.

**Von Kármán Lecture Series**—Dr. Chuck Weisbin, program manager for robotics and Mars exploration technology, will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

### Friday, September 18

**JPL Dance Club**—Meeting at noon in Building 300-217.

**OEMA Technical Briefing**—"Obtaining Solutions To Radiation and Plasma-Induced Failure Modes From Physics" will be presented by Dr. A. Robb Frederickson, Reliability Engineering Section 505. At noon in Building 180-101.

**Von Kármán Lecture Series**—Dr. Chuck Weisbin, program manager for robotics and Mars exploration technology, will speak at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.



BOB BROWN / JPL PHOTO LAB

Mount Vernon Middle School students watch with joy, above, as JPL science educator Richard Shope, far right, leads a teacher and students in a demonstration of the concept of gravity-assisted spacecraft travel. Students at right check out a display board showcasing JPL missions.



The Planetary Society's computer-controlled rover models also proved quite popular. Mount Vernon science teacher Keith Coleman, third from left, assists a student using a laptop to move the vehicles.

## South L.A. schools feel out of this world

*JPL's 'Outer Planets to the Inner City' road show piques students' interest*

By MARK WHALEN

JPL science educator Richard Shope likes to perform mime, role-play with children and spread the word about the excitement of astronomy and science.

He's had a good time of it lately, thanks to a series of performances jointly sponsored by JPL and the Planetary Society, as close to 2,000 inner-city children have learned how much fun it can be to learn about science while being entertained.

JPL's "From the Outer Planets to the Inner City" last month brought Shope and his student assistants to South Los Angeles' Mount Vernon Middle School, Bethune Middle School and

Challenger Boys and Girls Club.

How does one show students such concepts as gravitational force? For Shope's demonstration, one student wears the loop of a rope around the waist and plays the role of a planet while two or more others hold the ends of the rope tightly, playing the role of the sun. Then, other children, in turn as "spacecraft," get a running start and grab hold of the orbiting "planet," suddenly accelerating. When they let go, they know they've personally experienced a gravity assist of their own.

"They love being flung around," Shope said. "But they also learn something about how a gravity assist works—that it's not just the planet's pull on its own, but the dynamics of a two-body gravitational system, the planet and the Sun combined. It's a little primer in elementary physics, and many of the kids—and even the adults—can better recall the lesson afterwards."

Students also enjoyed the Planetary Society's "Red Rover, Red Rover" display, which demonstrated computer-controlled rover models on a simulated Martian surface.

Standing before a backdrop of a Mars Rover mural on the side of a U-Haul truck donated by the company for his travels, as well as a large

display showing the variety of missions JPL manages, Shope provided the students and teachers with a JPL overview while wearing a jacket made from the same material as Cassini's thermal blanket, which many of the students wanted to feel first-hand.

The live presentations are followed up with other teaching efforts that include computers (JPL has donated computers to each school visited), science and technology. Prior to the demonstrations for the students, Shope provides educator workshops and curriculum support materials for teachers.

"These shows demonstrate a unique way to communicate with schools and their science departments," he said. "The purpose is to raise visibility for NASA's space programs and to show we've got a model for a program that works in urban settings."

Shope pointed out that besides himself, several other JPL employees are involved—in particular, Bethune Middle School graduate Annie Richardson of the Earth Geosciences Research Element and former X2000 software engineer Clark Snowdall—forming a small core group that has led the way for a number of others on Lab to participate in educational outreach for inner city youth.

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**Inflatable rover team leader Jack Jones (left) shows off 1.5-meter-high (5-foot) inflatable wheels. JPL summer employee Enrique Garcia, above, is shown next to a prototype version of the inflatable solar array that he helped design last year at the age of 16.**

## Student's drawings yield his dreams

*Sketches for inflatable solar array turn into working prototypes*

By JOHN G. WATSON

As inflatable instruments, antennas, solar arrays, rovers and related technologies gain increasing credibility and usefulness, growing teams of engineers working with JPL Space Inflatable Technology Manager Art Chmielewski are combining their talents to dream up yet more "blue sky" ideas.

Nowhere has the collaborative nature of the development effort been more clear than with inflatable rovers, guided by team leader Jack Jones, and with solar arrays, whose development has been advanced from an unexpected source—a teen-aged summer employee.

During the Mars Pathfinder landing in July 1997, Jones and Chmielewski analyzed ways to transform the Sojourner rover into inflatable technologies that could be launched folded up like origami, then unfolded and rigidized in space or on celestial bodies when needed. Working to help design and fabricate the rover have been JPL engineers Jay Wu, David McGee and technician Tim Connors.

Everyone associated with the resulting rover development effort can take pride in the

results: an inflatable rover with 1.5-meter-high (5-foot) wheels. According to Jones, when a half-size scale model of the inflatable rover was tested at JPL's Mars Yard "not only did it climb up over everything, but it was drawing from very little power—less than 10 watts—and it was going fast, around 1,000 meters per hour (.6 mph)." By comparison, Sojourner traveled no more than 7 meters in a single day on Mars.

"Our model will be lighter than Sojourner, will travel 1,000 times faster and is projected to go 1,000 times further," Jones said.

"A limitation I could see with our rover is tire wear," he added. "If you want to travel thousands of kilometers on Mars, you have to have pretty good tires. We'll know more about how durable the tires are when we test them in the field."

Among the unexpected inputs to inflatable solar array development was a computer-animated drawing created last year by Enrique Garcia, a summer employee who was only 16 years old at the time.

When Enrique was growing up in Pasadena in a bilingual home with his Spanish-speaking mother, Eduarda, he dreamed of becoming a comic book illustrator.

But his life has taken a different turn: last summer, the budding artist and computer graphics whiz used animation software to create drawings for an inflatable solar array. This summer, as Garcia now heads to college, his sketches have been transformed into actual working prototypes that are available for use on future NASA missions.

"It was cool to see my drawings turn into something real," said Garcia, 17, who just completed a second summer employee stint at JPL and has now started classes at Chaffey Community College in Rancho Cucamonga, where he is majoring in computer animation. "But it was also bizarre, because I'd never dreamt of anything like that happening."

When Garcia was 10, Eduarda, a single mother originally from Mexico, contacted the Catholic Big Brothers program, one of more than 500 affiliates of Big Brothers of America, to team him with a Big Brother—a member of the community who would serve as a father figure to her son. The candidate turned out to be Chmielewski, whose own father, coincidentally enough, had been a comic book illustrator in his native Poland, which helped the pair to bond quickly.

Chmielewski arranged for Garcia to use a computer loaded with computer graphics software, and Garcia was soon off and running. The young student honed his skills two years ago when, as a junior at Upland High School, he became a certified advanced microcomputer repair technician through a regional occupational program in nearby Claremont.

As a student employee this summer and last, he worked not only on computer graphics tasks but also web mastering and video editing projects. Chmielewski's staff discussions during the Mars Pathfinder landing inspired Garcia to use graphics software to draw an inflatable, balloon-shaped solar array capable of picking up sunlight from a variety of angles.

Chmielewski was so taken by Garcia's efforts that he approached Chuck Weisbin, JPL robotic technology manager, for funding to transform the solar array design into several working prototypes. Today, this technology is part of a growing arsenal of inflatable technologies ready to be adapted to the specific needs of new NASA missions.

"If I had never met Art, I would never have even thought of working at a NASA research lab," said Garcia, who has also contributed drawings of inflatable rover "garages" and "monster" Mars trucks. "I was a typical fifth-grader, thinking about drawing comics, but I never thought I'd ever be picturing ideas for the space program." □

# Teachers learn empowerment through astronomy

By MARK WHALEN

As another summer vacation comes to an end, yet another group of local school teachers has completed a JPL summer program that uses astronomy to revitalize their interest in teaching science and enrich curriculum for their students.

"Teachers Touch the Sky," an annual summer program now in its fifth year, engages teachers of grades 3 through 10 by combining hands-on activities with lectures by JPL scientists.

"We try to teach scientific processes rather than a body of facts," said Dr. Bonnie Buratti of JPL, principal investigator of the program. "When the teachers learn science by doing, they become experts in their own classroom and communicate this excitement for science to their students."

Seventeen teachers—representing school districts in Pasadena, La Cañada, Glendale, Temple City and Los Angeles, as well as a few private schools—participated in the week-long program during the first week of August. Six of the teachers reprised their participation from previous years.

When the program started in 1994 and the Magellan mission to Venus was still in progress, Buratti led the teachers in creating a Venus "topography box" out of papier mâché, a contour model that related an analogy to radar and where one might predict an area to land a spacecraft. The same activity has now come to be known as the Titan topography box, named for the Saturnian moon.

Other activities that have been part of the program from its beginning include the construction of telescope models and impact craters. In an activity that converts students into "mini-investigators," craters are formed in a bed of sand in an experiment similar to those done by scientists at NASA's Ames Research Center. In a related activity, students are able to predict the number of mass extinctions that occur on the Earth from large impacts. This year, Buratti said, computer instruction was also included, in addition to elements of the Origins and Mars programs.

New hands-on activities for the teachers included investigations of the orbital motion of Jupiter's moons; light and spectra; and experiments on Mars water erosion. These activities were enhanced by guides provided by the Great Explorations in Math and Science (GEMS) program, run by the Lawrence Hall of Science at UC Berkeley.

In the latter study, teachers began their investigation by creating models of terrestrial erosional features caused by running water, as outlined in the GEMS guide "River Cutters." They then used pictures of Mars from JPL's Regional Planetary Image Facility to analyze geological features such as canyons, channels, runoff and alluvial fans, and compared how such observations could be made on Mars.

While a little more than half of Teachers Touch the Sky was devoted to hands-on activities, participants also learned a myriad of first-hand information about astronomy and JPL missions from the experts themselves.

Lecturers and their areas of expertise included Dr. Mark Allen, who discussed Titan; Buratti, the Clementine mission; Stephen



PHOTO BY DUTCH SLAGER / JPL PHOTO LAB

**Teachers Touch the Sky participants at JPL prepare to work on Mars water erosion experiments.**

Edberg, Cassini; Dr. Ralph Kahn, who spoke on JPL's educational electronic journal PUMAS (Practical Uses of Math and Science); Dr. Ken Nealson, life in extreme environments; Dr. Marc Rayman, Deep Space 1; Dr. Dave Senske, recent Galileo results; Dr. Suzanne Smrekar, Mars exploration; and Dr. Paul Weissman, comets, asteroids and mass extinctions.

Newcomers to the program took a tour of JPL, while returning teachers toured Caltech. In addition, Peter McClosky of the Educational Affairs Office introduced the participants to the Laboratory's Educator Resource Center, which offers to schools booklets, lithographs, posters, videotapes and curriculum materials that have been produced by JPL or NASA.

Other JPL employees who participated in the program were Drs. John Hillier and Kimberly Tryka of the Asteroids, Comets and Satellites Research Element 3238, who instructed the teachers along with Buratti.

The experience also served two Caltech students, Diana Lavelly and Patrick Necessian, who worked on the project as part of the campus' Teaching and Interdisciplinary Education (TIDE) program, which enhances science teaching at all school levels. This was the first time that TIDE students participated in a JPL program, Buratti noted.

Teachers Touch the Sky's overriding goal, she added, is to get students to think like an investigator, motivate them to excel in technical subjects and have an appreciation for science in general. "That doesn't necessarily mean that they'll become scientists," Buratti

said, "but they will appreciate its importance and relevance."

Buratti noted that the six teachers who returned to the program and had implemented the lessons into their curriculum "found it very effective in their classrooms. Although time constraints didn't allow all of the activities to be implemented, students were quite enthusiastic."

An extensive evaluation was done at the end of this summer's program, Buratti said, where teachers were asked to rate its value. The feedback was overwhelmingly positive. For overall effectiveness, 16 out of the 17 participants gave the program a rating of 5 out of a possible 5, while a lone holdout gave it a 4+.

Of the program's individual components, computer activities were rated the lowest, at 4.3. "This showed us that computers are not yet that effective in the classroom," Buratti said. "They don't teach you how to think; the whole organizational process comes from your mind.

"The teachers indicated that computers are good as a supplement to teaching, but not as a substitute." A good example, she noted, was that World Wide Web research was found to be effective to update facts, but not to establish background material.

"The most important lessons to come out of the program are the hands-on activities and the concept of following through with the scientific method," Buratti said.

For information about Teachers Touch the Sky, visit the program's home page at <http://www-scjn.jpl.nasa.gov/teachers>. □

## ISO classes offered this month

By KERRY LYN CASSIDY  
*ISO 9001 Implementation Team*

A number of classes are being developed to get the Lab up to speed in preparation for its ISO 9001 pre-assessment audit on Nov. 16. These classes will be targeted to specific audiences, from process owners to all employees.

- A class titled "How to Be an Effective Process Owner" is being developed, which will include segments on ISO elements, documentation and corrective action—the key aspect of which provides employees with an opportunity to improve processes.

- The ISO 9001 management seminar for section managers and above is being expanded to include information on process-based management.

- A two-hour ISO audit-preparation class for group supervisors will be held Sept. 8, 9 and 10. Central to this class will be an ISO audit worksheet, a tool to help employees answer questions concerning ISO 9001, process-based management and where they fit in. Supervisors will be shown how to instruct their employees to fill-out and use this worksheet as preparation for upcoming assessments

and audits.

- Group supervisors will also be offered a more comprehensive, half-day class on ISO and process-based management as an aid to coaching their groups on documentation and corrective-action procedures.

- Corrective action classes for management, as well as those for all Laboratory personnel, are being developed on how to generate and complete a corrective action notice.

These classes will be offered Lab-wide during the month of September. Registration is available online at <http://hr/et>.

The ISO/process-based management web site at <http://iso> has also been expanded in recent weeks to include new information and training opportunities. □

## ISO overview Sept. 4

An overview of process-based management and ISO 9001 will be presented Sept. 4 at 11 a.m. in von Kármán Auditorium.

Jerry Suito and Richard Brace of the ISO/process-based management team will explain the significance of the ISO 9000 initiative, how it relates to process-based management, how and why JPL has decided to organize the Lab according to process, and what the Lab is doing to become ISO registered by March 1999. □

## Aquarium

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within the hot water vents?

"If so, what are the temperature limits for their survival and what are the chemical conditions they need for growth?" Lane said.

The search for life and organisms in extreme environments has prompted scientists to examine the thin, gelatinous (jellyfish-like) veils of material that have been previously observed at underwater volcanic hot water vents. Although there have been only a few observations of this material, on at least one occasion the white material has appeared to actually come from the vent throat. Measurements of thermal conditions inside the vents have produced a range of temperatures from near 80 C (176 F) to almost 350 C (662 F). The presence of life forms inside these vents would challenge what scientists believe is the accepted temperature range for life to exist. Currently the accepted temperature range is about minus 5 C to 110 C (23 F to 230 F), according to Lane.

The team will next take the probe to Hawaii in October. The goal of the Lo'ihi mission in Hawaii is to develop an instrumented underwater probe that can be placed inside these deep, hot water vents.

"The probe will determine temperature, chemical state, nutrient supply, the identity of organic material and conduct limited visual imaging," said JPL's Lloyd French, project lead and system architect for the probe mission. "The first experiments will concentrate

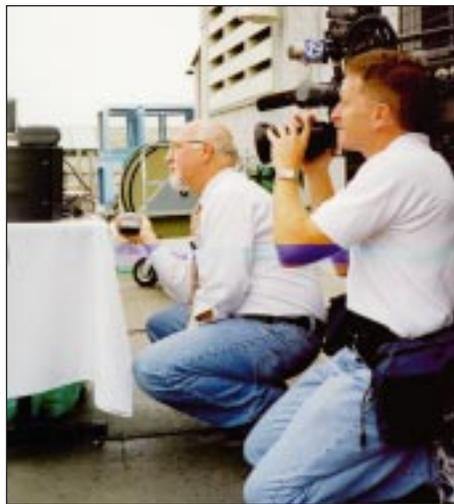


PHOTO BY MARY HARDIN

**Principal investigator Dr. Lonne Lane checks out the status of the underwater probe via a computer monitor as a television news cameraman records the event.**

on temperature and imaging the vent walls, while the chemical and spectroscopic instruments are being developed for the second-year deployment. The scientific probe will be placed inside the underwater vent by a robotic arm controlled from within an underwater submersible."

The Lo'ihi mission is a joint venture between JPL and the University of Hawaii, with involvement from Hawaii Undersea Research Laboratories and the Monterey Bay Aquarium. □

## Briefs

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toys, which are expected to include biological, geological and chemical sampling test kits. □

Nominations for JPL's Process Improvement Awards are now being accepted through Sept. 14.

The award is designed to recognize teams of people who have successfully implemented and measured improvements to JPL processes.

Representatives of award-winning teams will be considered as candidates to represent JPL at the 14th annual Continual Improvement & Reinvention Conference to be held in Alexandria, Va. April 21, 1999.

Nominations may be submitted by any JPL employee, subject only to having the appropriate process owner's endorsement. Only team nominations will be considered for this award, and self-nominations will be accepted. Team members listed on the nomination must have had an active role in the accomplishment.

The selection committee includes **Julian Blois** (Section 340), **Lisa Wainio** (388), **Stephen Wall** (305), **Larry Wright** (504) and **Rod Zieger** (730), with **Dick Laeser** of the Director's Office as the committee chair.

Committee members have been selected because of past experience with process improvement, Laeser said. Wright and Zieger led process improvements that were 1997 award recipients and Blois, Wainio and Wall were on last year's committee.

The committee will evaluate each nomination against the following criteria:

- Metrics: results of measured improvements as compared to measured baseline. Possible metrics include process cycle time, process cycle cost, waste reduction, or any other process result that is important to the process customer.

- Return on investment: value of the improvement to the Laboratory and/or customer vs. the resources invested in the change.

- Initiative: level of effort, resourcefulness, ingenuity and assumption of responsibility for process results demonstrated by the team.

- Alignment: alignment of the improvement with JPL's implementation strategies and change goals.

Award recipients will be recognized at award presentations in November and December 1998 when team plaques and individual team member mementos will be presented to award recipients in their local work area.

For more detailed information regarding this award, including last year's recipients, and to download a nomination form, see the Process Improvement Award home page at <http://eis/sec614/reward/pi.htm> or call Reward & Recognition Program Administrator **Monica Garcia** at ext. 4-3825 or Laeser at ext. 4-3622. □

PASSINGS

Former JPL deputy director Luedecke dies

Alvin Luedecke, who served as deputy director of JPL for three years beginning in August 1964, died Aug. 9 in San Antonio, Texas after a short illness. He was 87.

Prior to his tenure at JPL, Luedecke was a U.S. Air Force officer for 25 years and also served as general manager of the U.S. Atomic Energy Commission for five years. At JPL, he functioned as the Laboratory's general manager, responsible for day-to-day technical and administrative activities.

After resigning from JPL in August 1967, Luedecke returned to his alma mater, Texas A&M University, where he served as an associate dean.

Luedecke is survived by his wife, Isabelle, and children Alvin Jr., Jan Lee Maynard and Miriam Adair Luedecke. He is also survived by three grandchildren and one great-grandchild.

Services were held Aug. 14.



Alvin Luedecke

Clifford Alpaugh, 88, a retired senior contract negotiator in the former Section 626, died of congestive heart failure July 15.

Alpaugh worked at JPL from 1963-77. He is survived by his daughters, Jennifer Alpaugh and Melinda Ojermark.

Services were held July 21 at Forest Lawn Memorial Park in Covina Hills.

Nedward Mitchell, 82, a retired security guard in the former Section 613, died of pneumonia Aug. 14.

Mitchell joined JPL in 1962 and retired in 1981. He is survived by his wife, Barbara, and daughter Susan Loggins.

Services were held Aug. 22 at Community

Presbyterian Church in West Covina.

Thomas Bickler, 76, a retired senior engineering associate in Section 350, died of pneumonia Aug. 22 at a nursing home.

Bickler worked at the Lab from 1951-87. He is survived by his wife, Marjorie, son Thomas and daughter Dawn Bent.

No services were held.

John Kiefer, 83, a retired compressor specialist from Section 346, died of an aneurysm Aug. 24.

Kiefer joined JPL in 1959 and retired in 1979. He is survived by daughters Gayle Granucci and Linda Clifford and son Dennis Kiefer.

No services were held.

Corrections

A photo in the Aug. 21 issue of Universe inadvertently misidentified an employee preparing to inscribe a microchip with names for the Stardust mission. That employee is Dr. Richard Muller of Section 346.

Also in the Aug. 21 issue, Regina Sakurai of Element 3239 should have been listed among those who received JPL's Notable Organizational Value-Added (NOVA) awards in July.

Ad deadline extended

Due to the Sept. 7 Labor Day holiday, the deadline for submission of Universe ads for the Sept. 18 issue has been extended to Tuesday, Sept. 8 at 2 p.m.

Students

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"It's been a pilot project, creating a model that works within urban and rural settings, and laying the groundwork for a more nationwide effort."

Shope said he is also serving as the Solar System Exploration Education and Outreach Forum's representative to a working group sponsored by NASA's Office of Space Science that will address an agency-wide attempt to engage historically minority colleges, community leaders and lead science teachers. "We hope to ask them what they need to further their science education efforts, and how we can match up our resources to help them," he said.

Shope is also scheduled to take Outer Planets to the Inner City to the airwaves. He's been invited to appear this fall on the new Donny and Marie Show, a syndicated program hosted by the Osmonds.

LETTERS

Sincere thanks to all our friends at JPL who extended kind thoughts and prayers for the loss of my mother.

Paul Ash and family

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My family and I would like to thank the Microwave Atmospheric Science Group, the ERC and everyone who sent their condolences and flowers for the death of my father, Darrell W. Smedley.

Andrea Smedley

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The family of Lewis Edward Lacey would like to thank all of his AlliedSignal, OAO and JPL friends who were so kind during his illness and in his passing. Your cards, flowers and prayers have meant a great deal to us all. Thank you.

The Lacey family

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It is a pleasure for me to acknowledge the work of the TAP committee and especially Dorothe Horttor, Dave Curkendall and Tim Brice in staging a superb career reorientation (retirement) party for me. Thanks also to those who attended and made it such a memorable occasion. The friendship expressed by the many colleagues who attended the ceremony in von Karman was indeed gratifying. I have been fortunate to spend a most rewarding 18 years at JPL. I hope to continue collaborations with JPL from my new position as Senior Faculty Associate at Caltech.

Terry Cole

□□□

I express my very sincere thanks to those who conveyed sympathy via cards and to ERC for the nice plant at my mother's death recently. This once again proves that JPL is a very caring family.

Edward Ng

FOR SALE

BABY ITEMS: crib and mattress \$100; chest of drawers & chang-

er \$150; car seat/carrier \$50; other items at reasonable price, all in vg cond. 248-8853. CAGES for canaries and finches, new and used, reasonable price. 626/798-6248. CANDLES, boxes of 12/12" x 8", unscented, peach, rose & colonial green colors: \$6/box; also scented 2" wide candles. 626/398-4960. CANISTERS, ceramic, for tea, sugar, coffee; two 5" diameter and two 6" diameter; white w/blue flower designs; all four for \$8/obo. 626/568-8298. COMFORTER, extra-large king, lightly quilted, periwinkle blue, almost new, \$30. 626/398-4960. COMPUTER, California microchip model 386-40, 144 cts, 1024 x 768 svga color monitor, Oki data/Oki laser 400 LED printer, best offer. 763-5550, Pat. COMPUTER, laptop, Mac PowerBook 5300 CS, 28.8 Ethernet/fax modem (PCMCIA), color Stylewriter 2200 w/battery (portable printer), 2 computer batteries, 48 MB RAM, 540 MB hard disk, dual scan screen, exc. cond., \$2,000/obo. 626/585-8174. COMPUTER, Macintosh Centris 650: 32 MB RAM, 230 MB HD, internal CD drive, external SupraFAX modem 28.8, manuals, CD ROMs and OS 7.1., \$700. 909/845-5807. CRIB, light oak, and mattress, vg cond., \$80; CHILD CAR SEAT, vg cond., \$25. 626/798-7446. CUPS/Franciscanware, desert rose, \$7/ea. 626/398-4960. DESK, \$20; STROLLER, \$10; BABY SWING, \$20; TOT LOCK CHAIR, \$10. 626/966-5391. DESK with storage and chair for K-6-age child for homework, \$50. 790-4455. DINING ROOM SET, 6 chairs, \$300; COUCH, \$200; CHILD'S BED, mattress, like new, \$200. 626/445-6100. DRESS, flower girl's, sz. 7/8, white chiffon, trimmed in white satin w/detachable peach/white flowery bow, peach/white flowery crown, white satin gloves, sz. 7/8, and white satin basket. see to appreciate, \$100. 626/798-0033. FAX MACHINE, Panasonic Kx-F195, telephone/ answering

machine/fax/copies, \$50. 626/398-3381. FOOTBALL CARDS, 1 box, 24 unopened packs ProLine DC3, major stars/rookies incl. Marino, Elway, Young, Rice, E. Smith, Alkman, etc., \$25. 626/914-6083. FUTON, queen, with cover, \$30/obo. 790-0801. GROUP SET, Woodgrain (brown) laminated corner for bdrm. (i.e., corner desk, chair, cabinet w/drawer, 3-drawer dresser), perfect for spare bd. or teenager's rm., vg cond., \$150/obo. 626/337-7522. HAIR DRYER, professional, chair style, works well, \$35/obo. 956-1744. HEADBOARD for queen-size bed, elegant dark wood, small built-in mirror and bookshelves, exc. condition, \$200. 626/568-9439. MOVING SALE: Day bed, vg cond., white metal Victorian, \$125; Etagerie entertainm't system, rm. div., collec. displ oak w/glass/oak shelves 48" x 76" x 18", \$225; 36" directors chairs, nat. canvas, vg cond., \$15 or 4/\$50; butcher-block table, 44" diam., vg cond., \$100; Salomon ski bots, ladies 8.5, gd. cond., \$50; skis, 183 cm, gd. cond., \$50; poles, gd. cond., \$5; leather x/c ski bag, \$25; ice skates, ladies, near new, 8.5, exc. cond., \$25; tire chains, 175/170-13, vg cond., \$25; Bell helmet, sm/xs, nr. new, exc. cond., \$25; Wilson tennis racket, vg cond., \$70; obo on any; deliver furniture within 20 mi. 626/398-4698, Pat. NECKLACE, diamond, lovely 1940s 1/2-carat silver on 16" chain, excellent, 1 1/2" wide by 1/2" tall, \$1,200, see photo at http://www.jps.net/jackieg/forsale/necklace.gif. 310/390-3502. PRINTER, HP DeskJet color, \$100; GUITAR, 12-string w/case, exc. cond, \$200; OBOE, Conn, exc. cond., \$300. 248-5274 or dshirley@earthlink.net. PRINTER, HP DeskJet 600, 2 yrs. old, w/PC cable and extra color cartridge, \$85. 213/663-0769. PUPPIES, pure-bred English Beagles, w/papers, \$350/ea. 626/964-3873, Andy. REFRIGERATOR/FREEZER, Frigidaire, 12 cu. ft., \$60; WASHER, Kenmore large capacity, timer needs work, hence \$25; DIN-

Continued on page 8

ING TABLE, 5' oval wood, recently refinished natural top & cherry legs, \$50; ARMCHAIR, roomy, comfortable, with grey/white stripe slipcover, \$100. 626/793-7771, Andy, REFRIGERATOR & WASHER, \$200/ea. 626/285-7316. ROCKING HORSE and rocking boat, Little Tikes, \$10/ea., CAR SEATS (2), Century, \$25/ea., potty, \$5. 626/355-9733. ROWING MACHINE, good condition, cheap. 626/303-3016. SOFA, Damask, 8', white and gold, \$100. 949/673-3353. SOFTWARE, never used: Tomb Raider 2 (\$25), Word 97 (\$25), Word Perfect Suite 7.0 (incl. Quattro, Corel flow, etc.) (\$25), Print Studio Draw premier edition w/33K clip art bonus (\$25), Adobe Photodelux (\$25), IBM Via Voice (\$19), Logitech digital deluxe joystick, worth \$75 (\$25), Windows 95 tutorial (\$10), Windows 95 complete version w/Fat 32 (\$69), Deluxe typing tutorial (\$10), Office 97 CD tutorial (\$10), Decent 2 (\$10), Compton's CD encyclopedia (\$10). 626/335-4409.

STEREO CABINET & SPEAKERS: University woofer, tweeter and mid-range; Gerrard turntable, amp, \$200; cabinet, 60" x 19" x 29", 2 speakers, 24" x 19" x 29. 949/673-3353.

STOVE, Tappan, white, gas, needs cleaning, \$150/obo. 626/966-5391.

TABLE, dining room, round, mahogany, sits 8 w/2 extensions, almost new, comes w/6 matching chairs, \$700/obo. 626/568-8298.

TELEVISION, 19", in wood cabinet, \$50; COUCH, 3-person, gd. cond., \$50; both avail. Sept. 7. 626/795-1565.

TREADMILL, good cond. w/1-yr. maint. contract, \$85. 249-2283.

TURNTABLE with grade cartridge. 626/446-5835.

VIDEOS: Caddyshack, Red Scorpion, Dick Tracy, Roger Rabbit, Jumanji, Willow, Nightmare Before Christmas (unopened), Teenage Mutant Ninja Turtles, Die Hard, Dirty Rotten Scoundrels, Princess Bride, Young Frankenstein, all Star Treks, \$5/ea.; box sets: Indiana Jones, Trilogy, Wallace & Gromit, The Good the Bad and the Ugly, Star Wars trilogy, Hunt for Red October, Patriot Games, Clear and Present Danger, \$30/ea. 805/496-8297, Mike.

WASHER, GAS DRYER, REFRIGERATOR, Kenmore, white, like brand new, 1 yr old.; \$200/each for W & D, \$300 for frig., exc. buy. 626/744-0929.

WEDDING DRESS, white with beautiful beading throughout, sheath, half train, size 6, with hat, garment bag, storage/shipping box, \$400, see photo at <http://www.jps.net/jackieg/forsale/wedress.gif>. 310/390-3502.

WINDOW SHUTTERS, wood interior painted white, 14 3/4" wide x 67" high, 4 avail., exc. cond., \$40/ob for all four. 626/791-7645.

## VEHICLES/ACCESSORIES

'85 BMW 528E automatic, loaded, sunroof, charcoal gray, clean cond., runs well, only 87,000 orig. miles. \$4,400/obo. 626/443-9774.

'72 CADILLAC CDV, newer paint, interior needs some work, new

headers, \$775. 249-6786.

CATAMARAN, 13' Alcort, with trailer, \$400. 626/294-0426.

CHEVY S-10 truck bed liner, gd. cond., \$75/obo. 626/966-5391.

'89 CHEVY Z24 convertible, a/c, V6 auto, am/fm/stereo, pwr. windows, 100K, well maintained, runs great, \$3,950/obo. 952-1304.

'92 CHRYSLER Le Baron, 4 door, auto, tilt wheel, pwr. doors/windows, deluxe interior, 63,300 mi., \$6,300. 957-7554, Bob.

'96 DODGE Grand Caravan SE, 3.3 V6 eng., 7-passenger, 2 sliding doors, rear a/c, 2 alarms, 34,000 mi., exc. cond., \$18,800/obo. 626/798-9941, Iv. mng.

FORD camper shell for full-size truck, blue, carpet, bench seats, \$500. 626/797-5387.

'73 FORD Contempo Escort motor home 302 V8, 61K miles, self contained, new paint, good condition, runs great, ready to go, sacrifice \$3,500. 213/222-0485, Joe.

'88 GMC 1-ton extended cab, loaded, pwr. doors, pwr. windows, tilt wheel, camper pkg., towing pkg., shell, carpet kit, trans. & eng. oil coolers, 2 new & 2 nearly new tires, only 61,500 miles, 7.4L engine, \$10,500. 957-7554.

'89 HONDA Accord, hatchback, auto, 95,000 miles, A/C, CD player, orig. owner, gd condition, \$5,000/obo. 626/799-7409.

'93 MAZDA MX6, 4 cyl., ruby red, 1 owner, non smkr., auto, air, sunfr, power win/str, tilt, cruise, AM/FM/cass., new batt, 2 new tires, 67K, runs great, \$6,700. 310/390-3502.

'86 MERCEDES BENZ 190E, auto, all pwr., org. owner, \$3,450. 790-3802.

'57 MERCEDES BENZ, diesel, vintage, only 2 owners, \$2,500/obo. 626/296-1853.

'93 MERCURY Cougar, V8, all power, 40,000 mi., exc. cond., \$9,000/obo. 626/798-3935.

'93 MERCURY Tracer wagon, A/C, auto, low mi., new trans., looks good, runs great, \$5,800/obo. 626/446-2762.

'72 MERCURY Marquis, great ride & engine, 78K mi., minor rear body damage, \$650. 249-6786.

'92 MITSUBISHI Eclipse, black, all pwr. equip., 5 spd., 16-valve DOHC eng., 82,500 mi., priced below Blue Bk. at \$4,500. 249-6068.

'94 NISSAN Altima, auto, all pwr., a/c, stereo, cass., 54k mi., gd. cond., \$8,450/obo. 909/599-3230.

SAILBOAT, 13-ft. Zuma, as new, cartoppable \$1,200. 626/294-0426.

'95 TOYOTA Previa LE S/C van, immaculate, 40,000 mi., 4-wheel ABS, alarm, a/c, cassette, tilt wheel, cruise control, power windows, locks & mirrors, burgundy with gray interior, \$18,500/obo. 909/980-3508.

'95 TOYOTA Tacoma truck, Xcab, very low mileage (30k), auto, 4 cyl., am/fm Alpine stereo/cassette, cruise control, bed liner, power steering, sliding rear window, exc. condition, like new, burgundy, \$10,900. 626/795-3251.

'85 TOYOTA Supra, runs great, looks good, fun to drive, DOHC-6, 5-sp., AC, PW, PD, \$2,900/obo. 626/284-9424.

'88 VW Cabriolet, Karman ed., convertible, perfect cond., black & white, automatic, A/C, cruise ctrl., \$4,275/obo. 626/792-5132.

'86 VW GTI, excellent condition, pull-out stereo, sheepskins, 153K miles, \$2,200. 957-5891.

'70 VW bug, rebuilt engine, new: seats, chrome wheels, tires, battery; not running, needs wiring completed, good project car, title is clear, as is \$950/obo. 626/309-0429.

## WANTED

CALCULATOR, HP 19C, printer can be working or not. 626/398-3192.

GARDENER, for 7,500 sq. ft. lawn, prune, tidy up yard, etc. 626/284-9424.

GUEST HOUSE for rent by Caltech employee in either La Canada, La Crescenta, or Sierra Madre area. 626/395-4104, Ann Murillo.

HOME RENTAL for JPL postdoc and family; seeking well-maintained 4-bd. (or 2 bd. + 2 office) house w/ garage (or workshop space), fenced yard, quiet neighborhood, starting last week of Sept.; 619/284-0207, Karen or Randy, or e-mail kbrinton@ucsd.edu.

SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523.

VANPOOL RIDERS, full-time, #20, stops in Northridge and Granada Hills. Ext. 4-0307, Marilyn.

VOLLEYBALL players, coed, all levels of play, every Tues. night 8-10 at Eagle Rock High School, \$4/night. 956-1744, Barbara.

## FREE

GLASS MIRROR, 69" x 36", u-haul. 626/446-7508, Peter.

MOTORCYCLE, '70 Yamaha 125 dirt bike, O.K. but needs clean-up to run; SPEAKER, hand-built monaural; ROCK COLLECTION, small; SNOW SKIS, downhill, old. 248-5274 or dshirley@earthlink.net.

## FOR RENT

ALTADENA house, looking for roommate (no pets) to share with one human, two dogs, A/C, W/D; just off Lake, above Altadena Dr., 5 min from JPL. \$450 + 1/2 util. 626/398-3933.

ALTADENA, beautiful location, 2 bd., 2 ba., furnished, W&D, lg. yd. w/deck, near mtn. trails., \$600 + 1/2 util. 323/964-8668, days; 626/798-6530, eves.

ALTADENA house, 3 bd., 1 ba., garage, stove, fenced back yd., water, gardener incl., \$1,100. 626/791-8113.

MONROVIA, rm. in 2-bd. townhouse, use all living space/kitch., priv. full ba., laundry, garage, part. furnished, no down, \$400 + 1/2 util., avail. 10/1. 626/357-0252.

MONTEREY HILLS condo, outside S. Pas., bright and airy,

priv. end unit on 3rd flr., grt. view, 2 bd., 1 ba., sep. vanity area, hwd. flrs., frpl., cathedral ceiling, cent. air/heat, balcony, stove, dishwasher, garb. disposal, cable, some util., pool, laundry rm. for w/d in unit or use of Indry. facil. on 3rd flr., security bldg., 2 sec. prking. spaces, close to 110 fwy., 10 min./JPL, avail. 10/10, \$900. 213/340-8360.

NW GLENDALE, beautiful 2-bd. home, living rm. peg & groove hardwood floors, wall-to-wall rest of house, fenced backyard, covered patio, 2-car garage, lease 1-yr. min., \$1,050. 626/304-9534.

PASADENA, cottage with bedroom & kitchen behind house estate area, 3 miles from Old Town and JPL; new paint, carpet, bath; security alarm; unfurnished; \$900, util. included, laundry not. 626/796-2662.

PASADENA studio house nr. Caltech, stove, refrig., water, gardener incl., \$485. 626/791-8113.

PASADENA townhome-style apt., 3 bd., 3 ba., cent. air/heat, sm. patio; \$1,100 unfurn., \$1,200 furn.; will rent to indiv. students @ \$300-\$400 ea.; can see beginning Sept. 20, call after Sept. 19. 626/351-9641.

SILVER LAKE, roommate to share 3-story townhouse, nr. Glendale & 5 fwy., rent lower flr.: 2 bd., full ba., priv. deck, share kitch., LR, DR, Indry; no pets, smokers; cable, alarm, install own phone (pre-wired); \$800 + \$800 sec. dep., incl. util. 310/712-6622.

SOUTH PASADENA, furn. studio apt. on 1 level, 1718 Huntington Dr. betw. Milan/Marengo; laundry facilities on premises, parking space; non-smoker; no pets; \$565, utilities pd. 626/792-9053.

## REAL ESTATE

ALTADENA, large, private, safe home on cul-de-sac, with pool, great location east of Lake, 7 min. from JPL, light & airy, \$325,000, seller flexible. 909/622-1479.

APPLE VALLEY, spacious double-wide mobile home in 5-star park near airport; a/c & cooler, fruit trees, roses; park has fishing lake, 2 pools, Jacuzzi, sauna and beautiful clubhouse, \$29,950. 760/946-0175.

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba, mud/laundry room, \$129,000. 909/585-9026.

MONTEREY townhouse, 3 bd., 2.5 ba., walk to JPL, quiet street, newer complex, former model home, bright and airy, \$173,000. 248-5848, Robert.

PASADENA house, charming, 3 blocks from Caltech, exc. cond., pool, cent. a/c, lots of extras, \$365,000. 626/449-8590.

## VACATION RENTALS

BIG BEAR, 7 mi. from slopes, full kitch., f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night min., no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann.

BIG BEAR LAKE cabin, near lake, shops, village, forest trails., 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc price from \$65/night. 909/599-5225.

BIG BEAR LAKEFRONT lux. townhouse, 2 decks, sleeps 6, tennis, pool, spa. 949/786-6548.

BIG BEAR LAKEFRONT, 1 bd., 1 ba., condo, sleeps 4, full kitchen, gym, indoor pool, Jacuzzi, BBQ areas, Oct. 16-23, \$75/night. 213/296-6641.

CAMBRIA, ocean front house, exc. view, sleeps up to 4, \$125 per night for 2, \$175 per night for 4. 248-8853.

HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 626/584-9632.

HAWAII, Maui, condo on beach w/ocean view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, bbq, slps. 4, 4/15-12/14 rate: \$95/night/2, 12/15-4/14 rate: \$110/night/2, 10/nite/add'l person. 949/348-8047.

LAKE TAHOE, N. shore, 2 bd., 2-1/2 ba. condo, sleeps 6, great location, private sandy beach, pool, sauna, walk to golf, fishing 150 yards from front door, 2 miles to casinos, extra-special JPL discount in Sept. 626/355-3886, Rosemary or Ed.

MAMMOTH, 2 bd., 2 ba., w/loft, sleeps 6-8, fully equipped kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. view, Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455.

MAMMOTH condo, 2 bd. + loft, 3 ba., slps 8, spa, pool, full kitch., TV/VCR, JPL disc. rates; walk to Canyon Lodge. 249-8088.

MAMMOTH condo, slps. 5, shuttle stop nearby, summer rates \$50/nt; 5 or more \$40. 353-7839.

MAMMOTH condo, in Chamonix, 2 bd., 2 ba., slps 6, fireplace, kitchen, microwave, TV, VCR, cable fm stereo, pool & sun area, Jacuzzis, sauna, game, rec., laundry rms., play & BBQ areas, conv. to hiking, shops, summer events; daily/weekly rates. 249-8524.

OCEANSIDE, on the sand, charming 1 bd. + condo, panoramic view, walk to pier/marina, pool, spa, game rm. 949/786-6548.

PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR; carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourn. kitch., bikes, 20' sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, indoor/outdoor pools, hot tub and beach; 8 lighted tennis courts, 10 min./skiing, casinos/golf, 1 hr./ wine country; \$995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; \$495/wk. low seas., + \$90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.